
Arnaldoa argentea (Barnadesioideae: Asteraceae), a New Species and a New Generic Record for Ecuador

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ABSTRACT. A new species of Asteraceae, *Arnaldoa argentea* C. Ulloa, P. Jørgensen & M. O. Dillon, from southern Ecuador is described and illustrated. It is characterized by its cream-white to light orange corollas and red-brown phyllaries covered by a dense silvery pubescence, especially on the adaxial surface. The genus was previously known only from northern Peru. A key to the species of *Arnaldoa* is presented.

RESUMEN. Se describe e ilustra una nueva especie de Asteraceae, *Arnaldoa argentea* C. Ulloa, P. Jørgensen & M. O. Dillon, del sur de Ecuador. Esta especie se caracteriza por las corolas de color blanco-crema a anaranjado pálido y las filarias café-rojizas cubiertas por un denso tomento argénteo especialmente en la superficie adaxial. El género anteriormente se conocía solo del norte de Perú. Se presenta una clave para todas las especies de *Arnaldoa*.

Key words: Andes, *Arnaldoa*, Asteraceae, Barnadesioideae, Ecuador.

Recent collecting efforts in the Andean region of southern Ecuador have revealed the presence of the genus *Arnaldoa* Cabrera in the country (Ulloa Ulloa & Jørgensen, in press). The genus was previously known only from northern Peru (Ferreira, 1995; Stuessy & Sagástegui Alva, 1993). *Arnaldoa* is a small genus of three species of shrubs, with long axillary spines, solitary, terminal, homogamous, discoid capitula, and pseudobilabiate corollas. It belongs to the South American subfamily Barnadesioideae (formerly included as Barnadesiinae in the Mutisieae, see Cabrera, 1977; Harling, 1991). The members of this monophyletic subfamily, sister group to the rest of the Asteraceae, are characterized by a unique indumentum of barnadesioid villous hairs (a long filiform cell attached to a swollen cell, which is held by a basal epidermal cell, see

Erbar & Leins, 2000) on the corollas, achenes, and pappus of most species (Bremer, 1994). Most members also have peculiar spines in pairs, sometimes solitary or three to five together between the subtending leaf and the axillary bud (Bremer, 1994). Various affinities with other, mainly Andean, genera of this subfamily have been suggested for *Arnaldoa*. Morphologically the genus has been placed between *Chuquiraga* and *Dasyphyllum* (Cabrera, 1962, 1977), and an intergeneric hybridization between *Barnadesia* and *Chuquiraga* has been suggested (Stuessy et al., 1996). A recent molecular phylogeny (Gustafsson et al., 2001) reveals a well-supported *Arnaldoa* clade also comprising *Fulcaldea* and *Dasyphyllum* subg. *Archidasyphyllum*. Although this group is morphologically heterogeneous, the placement of *Arnaldoa* based on morphological characters is inconclusive and neither strongly contradicts nor supports the molecular results (Gustafsson et al., 2001).

The species of *Arnaldoa* have narrow distributions and grow on wooded or shrubby slopes in more or less xerophytic habitats, between 1370 and 3000 m. The species known in Peru have showy bright orange-red or purple corollas, whereas the specimens from Ecuador have cream-white or light orange ones. Further comparison revealed that the latter represent a new species.

Arnaldoa argentea C. Ulloa, P. Jørgensen & M. O. Dillon, sp. nov. TYPE: Ecuador. Loja: Amaluza, road to the antennas above town, at the top, 5 Nov. 2000, 2400 m, 79°26'26"W, 4°33'58"S, P. M. Jørgensen, C. Ulloa, J. Carranqui, J. Madsen & O. Sánchez 2234 (holotype, QCNE; isotypes, F, LOJA, MO, QCA, USM, WU). Figures 1, 2.

Haec species habitu *Arnaldoae weberbaueri*, filamentis pubescentibus *A. macbrideanae* similis, sed a hac capitulo multo majore, ab illa filamentis pubescentibus atque co-

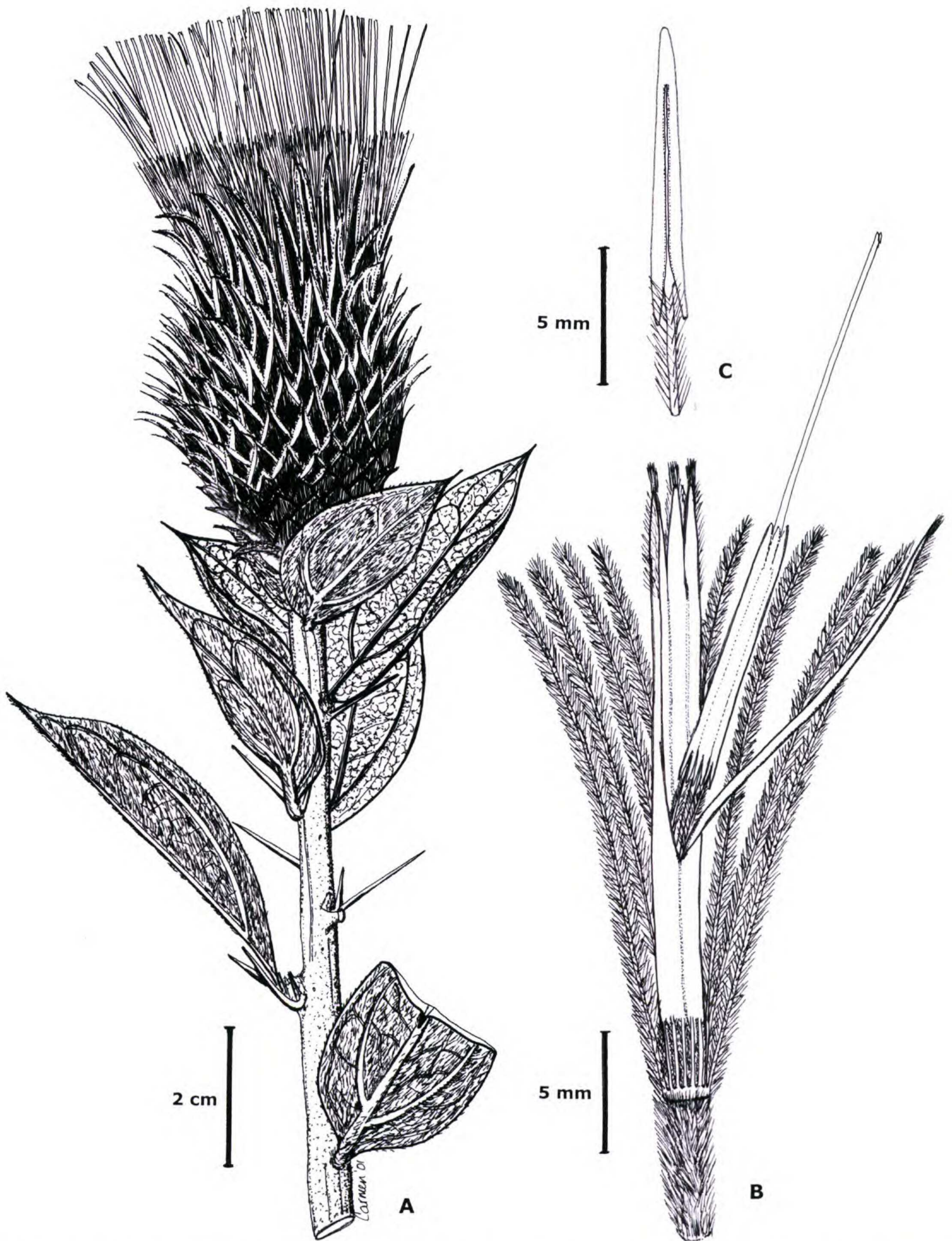


Figure 1. *Arnaldoa argentea* C. Ulloa, P. Jørgensen & M. O. Dillon. —A. Habit. —B. Floret with some pappus bristles removed. —C. Stamen. Drawing based on photographs taken at the type locality and the isotypes of *Jørgensen et al.* 2234.



Figure 2. *Arnaldoa argentea*. Flowering branch (left). Habit. Photographs by Jens Madsen taken at the type locality, 2001.

rolla ex pappo vix exserta, ab ambabus corollae colore distinguitur.

Tall, slender shrubs, up to 3.5 m tall, the branches striate, densely rufous hirsute-tomentose, glabrescent with age, with paired axillary spines, the longest to (17–)27 mm long, projecting at about 90° at the base of the petiole, generally with two additional pairs of shorter ones, 4–11 mm long. Leaves simple, alternate, decreasing in size toward the base of the capitula; petioles 3–6 mm long, densely tomentose, with long tan hairs, glabrescent with age; blades elliptic-oblong to ovate, (2.0–)4.3–7.8 × 1.2–4.1 cm, coriaceous, apex obtuse, spiny-mucronate, mucro 1.5–3 mm long, base unequal, entire, tomentose to sparsely tomentose at the base of the main nerve and becoming shiny adaxially,

densely tomentose abaxially and velvety to the touch, with long pale yellow to argenteous hairs especially along the veins and margins, glabrescent with age, 3-veined from near the base, tertiary venation finely reticulate. Capitulescence of solitary, terminal, sessile capitula, these homogamous, discoid, 40–58 × 35–50 mm, the involucre campanulate; phyllaries 11–15-seriate, slightly recurved at apex and spreading with age, the outer series dark green and progressively becoming red- to orange-brown toward the median and inner series, all densely argenteous tomentose in the 1/2–2/3 upper portion adaxially, and along the margins, glabrous at the base, sparsely tomentose to glabrescent on the abaxial surface, the outer phyllaries ovate to triangular, 6–12 × 5–6 mm, acuminate to cuspi-

date, with a spiny apex 3–5 mm long, the median phyllaries ovate, 15–18 × 3–5 mm, long-acuminate with a spiny apex 4–6 mm long, the margins slightly reflexed, the inner phyllaries lanceolate, 35–38 × 2–3 mm, the margins reflexed. Florets 55 to 70, the corollas 25–28.5 mm long, cream-white to light orange, pseudobilabiate, with a 4-lobed expanded limb and a single adaxial slender lobe, the tube 9–10.5 × 2.5 mm, glabrous, the limb 16–17 mm long, the lobes 4–8 mm long and densely white villous outside, the adaxial lobe filiform, as long as the limb, densely white-villous on the apical 5–6 mm; filaments free, white-villous, the anthers 10–13 mm long, caudate, the tails 1.5–2 mm long; style 30–44 mm long, the stigmas cream becoming dark orange-brown. Achenes cylindrical, 6–7.5 × 2 mm, densely white-villous; pappus of 21–26 villous bristles, 22–25 mm long.

Paratypes. ECUADOR. **Loja:** vicinity of Bellavista, at “Las Antenas” (6–7 km from Amaluza), 31 May 2001, 2200–2300 m, 79°27′024″W, 4°33′421″S, J. E. Madsen & C. Rosales 8175 (LOJA not seen, MO), 14 Aug. 2001, 2400 m, J. E. Madsen *et al.* 8341 (LOJA not seen, MO).

Distribution, habitat, and conservation. This species has only been collected on the top of a small mountain just outside the town of Amaluza, in a dry inter-Andean valley in the Province of Loja, between 2200 and 2400 m. It was collected in flower in May and June, less so in November, and in fruit in August and November (Madsen, pers. comm.). The area is heavily disturbed with only small patches of natural vegetation on the hill-sides. The long spines may protect these plants from the cattle and from being cut for fuel-wood; however, they may not survive fires. These factors combined with a so far very restricted distribution make this species extremely vulnerable.

Etymology. The specific epithet refers to the pubescence of the phyllaries and of the pappus, which gives the capitula an overall silvery appearance.

This new species can be readily recognized from the other species of *Arnaldoa* by its large silvery capitula, with red- to orange-brown phyllaries, the corollas barely exerted from the pappus, and the villous filaments. It resembles *A. weberbaueri* (Muschler) Ferreyra (including *A. coccinasantha* (Muschler) Ferreyra) by the large capitula and densely pubescent stems and leaves, but it differs by having broader phyllaries (outer ones 5–6 mm vs. 2–3 mm wide) that are more densely pubescent on the adaxial surface (vs. the abaxial), villous filaments (vs. glabrous), and the corollas just slightly exerted from the pappus (vs. much exerted). From

A. macbrideana Ferreyra it may be distinguished by the pubescent leaves and stems (vs. glabrous) and much larger capitula and florets. The corollas of this new species are very similar to, but larger than, those of *A. macbrideana* in their deeply lobed limb with villous lobes, while the rest of the corolla is glabrous both inside and outside; in *A. weberbaueri* the limb is only shortly 4-toothed at the apex and the corolla is densely villous on its upper half on the outside, and the tube is villous within. Although the corollas and styles of this new species turn light orange to dark brown with age, they cannot compare with the bright red-orange to purple showy corollas and styles of the other two species. The pubescence of the filaments was suggested as a species character (Erbar & Leins, 2000) to separate *A. macbrideana* Ferreyra from *A. weberbaueri* with glabrous ones. The species of this genus may be separated by the following key.

KEY TO THE SPECIES OF *ARNALDOA*

- 1a. Filaments glabrous; corollas 32–50 mm long, much exerted from the pappus, orange (rarely purple), the tube villous inside, the limb shortly 4-toothed and longer than the adaxial slender lobe; Peru (Ancash, Amazonas, Cajamarca, and La Libertad) *A. weberbaueri*
- 1b. Filaments densely villous; corolla slightly exerted from the pappus, the tube glabrous inside, the limb deeply 4-lobed and as long as the adaxial slender lobe.
 - 2a. Corollas 15–19 mm long, purple; capitula 2.5–4.5 cm long; Peru (Lambayeque and Piura) *A. macbrideana*
 - 2b. Corollas 25–28.5 mm long, cream-white to light orange; capitula 4.0–5.8 cm long; Ecuador (Loja) *A. argentea*

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Literature Cited

- Bremer, K. 1994. Asteraceae: Cladistics & Classification. Timber Press, Portland, Oregon.
- Cabrera, A. L. 1962. Compuestas andinas nuevas. Bol. Soc. Argentina Bot. 10: 21–45.
- . 1977. Mutisieae—Systematic review. Pp. 1039–1066 in V. H. Heywood, J. B. Harborne & B. L. Turner (editors), *The Biology and Chemistry of the Compositae*. Academic Press, London.
- Erbar, C. & P. Leins. 2000. Some interesting features in

- the capitulum and flower of *Arnaldoa macbrideana* Ferreyra (Asteraceae, Barnadesioideae). *Bot. Jahrb. Syst.* 122: 517–537.
- Ferreyra, R. 1995. Family Asteraceae: Part VI. *In*: J. F. Macbride and collaborators (editors), *Flora of Peru. Fieldiana, Bot. (n.s.)* 35: v, 1–101.
- Gustafsson, M. H. G., A. S.-R. Pepper, V. A. Albert & M. Källersjö. 2001. Molecular phylogeny of the Barnadesioideae (Asteraceae). *Nordic J. Bot.* 21: 149–160.
- Harling, G. 1991. Compositae–Mutisieae. *In*: G. Harling & L. Andersson (editors), *Fl. Ecuador* 42: 1–105.
- Stuessy, T. F. & A. Sagástegui Alva. 1993. Revisión de *Arnaldoa* (Compositae, Barnadesioideae), género endémico del norte del Perú. *Arnaldoa* 1(4): 9–21.
- , T. Sang & M. L. DeVore. 1996. Phylogeny and biogeography of the subfamily Barnadesioideae with implications for early evolution of the Compositae. Pp. 463–490 *in* D. J. N. Hind (editor), *Compositae: Systematics, Proceedings of the International Compositae Conference, Kew, 1994*. Vol. 1. Royal Botanic Gardens, Kew.
- Ulloa Ulloa, C. & P. M. Jørgensen. *In press*. Sobre la presencia del género *Arnaldoa* (Asteraceae) en el Ecuador. *In*: Z. Aguirre et al. (editors), *Botánica Austroecuatoriana—Estudios sobre los recursos vegetales en las provincias de El Oro, Loja y Zamora-Chinchipec*. Ediciones Abya-yala, Quito, Ecuador.